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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/065,738	11/14/2002	Soichiro Okubo	39.003-AG	6181

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EXAMINER

JUBA JR, JOHN

ART UNIT PAPER NUMBER

2872

DATE MAILED: 12/29/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/065,738

Applicant(s)

OKUBO ET AL.

Examiner

John Juba

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 October 2003.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-6,8 and 10-21 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 14,15,20 and 21 is/are allowed.
- 6) ☒ Claim(s) 1,4-6,10,13,16 and 17 is/are rejected.
- 7) ☒ Claim(s) 3,8,11,12,18 and 19 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 09262003.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Drawings

Applicants' proposed drawing changes, filed October 21, 2003 have been approved. The formal drawing sheet accompanying the proposed change is acceptable.

Specification

The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: There is no antecedent basis for the expression "selectively resonant structure" now recited in claims 1 and 6.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 16 and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Anthony, et al. Referring to Figure 4 and the associated text, Anthony, et al disclose a thin film of polycrystalline diamond having an extinction coefficient not exceeding 3×10^{-4} over the wavelength range of 1200 – 1700 nm. [The basis for this finding is as set forth in the last Office action (paper #6) and is incorporated by reference herein.] The expression “diamond-like carbon” is used so variously in the relevant art as to encompass crystalline diamond forms. The examiner believes that one of ordinary skill would regard polycrystalline diamond to be “diamond-like” within the specificity recited.

With particular regard to claim 17, Anthony, et al teach that the film is suitable for use in any of a variety of glazing applications (Col. 5, line 4). Since a glazing covers an optical aperture, the thin film of Anthony, et al fairly constitutes an “optics component” within the specificity recited. Specific instances of use of the film as an optical component are when the film is attached to the entrance aperture of the integrating sphere (Col. 3, lines 60+) or across the entrance aperture of the photomultiplier tube (Col. 5, lines 67+).

Claims 1, 5, 6, and 13 are rejected under 35 U.S.C. 102(e) as being anticipated by Matsushita, et al (U.S. Patent Application Pub 2002/0063941 A1). [The grounds of rejection stand *substantially* as set forth in the last Office action (paper #6) and are repeated here only for convenience.]

Referring initially to Figure 6 and the associated text and noting the detailed construction of assembly 10A shown in Figure 1, Matsushita, et al disclose an optical

isolator having wavelength selectivity comprising a magneto-optical section (31)(29)(23)(27)(28), a magnetic part (4), and dielectric multi-layer films (30) and (26) on either side of the magneto-optic section comprising alternating layers (24)(25) of high and low refractive index material, and polarizers (2A)(2B). The magneto-optic section thus comprises at least one dielectric layer (29), (23), or (27) interlaminated to create at least two magneto-optical parts (31) and (28) for rotating the polarization plane of incident light. Matsushita, et al expressly teach that each [magneto-optic] cavity thickness may be of $\lambda/2$ or a multiple of $\lambda/2$ (paras. [0057] & [0084]). Taking a multiple of 2, each cavity thickness will be $2 \cdot (\lambda/2)$. It should be readily apparent that the fundamental resonance will be at 2λ . But, Matsushita, et al make it clear that the cavity will also resonate at λ , since they disclose that the multiplied cavity length is still suitable for use at the "desired" wavelength, λ . Thus, at least the multiple half-wave embodiments of Matsushita, et al *inherently* exhibit localization and enhancement of the Faraday rotation at multiple (resonant) wavelengths. Further, a generally-recognized¹ inherent characteristic of Fabry-Perot structures such as that of Matsushita, et al, having a cavity index, n , and a cavity spacing, d , is that they resonate at each of a plurality of frequencies separated by a free spectral range given as $FSR = c/2 \cdot n \cdot d$. That is, Fabry-Perot structures have a response that is periodic in frequency. For example, considering a single half-wave cavity thickness for ($\lambda = 1.3 \mu\text{m}$), $n \cdot d = 0.650 \mu\text{m}$, leading to a $FSR = 3 \cdot 10^8 \text{ (m/sec)} / 1.3 \cdot 10^{-6} \text{ m} = 230.769 \text{ THz}$. As is well-known², the cavity will resonate at λ , $\lambda/2$, $\lambda/3$, $\lambda/4$, and so on (1300 nm, 650 nm, 433 nm, 325 nm . . .). Thus, the disclosed structure is an arrangement predetermined to create a resonant structure for

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localizing within said magneto-optical section, incident light of at least two wavelengths, as recited.

→It is believed that one of ordinary skill would regard a resonant structure that resonates at *predetermined* wavelengths as a "selectively resonant structure", as recited.

With regard to claims 5 and 13, notwithstanding the fact that the integrated assembly of Matsushita, et al involves vapor phase deposition of the dielectric layers, the recitation of the components as having been "formed integrally by a vapor-phase process" is not seen as imparting any positive *structural* limitation. As previously set forth, it is well-settled that the manner in which the thing is made is not germane to the patentability of the thing itself.

Note 1: See for example, Pelekhaty, U.S. Patent number 6,215,592 (Col. 5, lines 53 +):

"It is known that a Fabry-Perot filter will transmit at a number of resonant frequencies. The frequency spacing between two adjacent transmission peaks, e.g., 50 and 52, is known as the free spectral range (FSR), and is defined by:

$$\text{FSR} = c/2nd \quad (\text{equation 1})$$

where c is the speed of light in a vacuum (2.998.times.10.sup.8 m/s), n is the refractive index of the material between the mirrors, e.g., the refractive index of spacer 36, and d is the distance between the mirrors, e.g., the thickness of the spacer. Advantageously, therefore, the FSR of the filter may be controlled by variation of the thickness and/or the refractive index of the spacer 36."

Note 2: See for example, HANDBOOK OF OPTICS Walter G. Driscoll, ed., sponsored by Optical Society of America, McGraw-Hill (c) 1978. pp. 8-75 thru 8-85:

$$\text{"Maxima T occur at wavelengths at } \lambda_0 = \frac{2nt \cos \varphi}{k - \varepsilon / \pi} \quad k = 0, 1, 2 \dots \quad (64) \text{"}$$

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsushita, et al (U.S. Patent Application Pub 2002/0063941 A1), in view of RICOH CO LTD (JP 11-030770 A; hereinafter "RICOH"). [The grounds of rejection stand as set forth in the last Office action (paper #6) and are repeated here only for convenience.]

As set forth above for claim 1, Matsushita, et al disclose the invention substantially as claimed. However, Matsushita, et al do not disclose silicon oxide (SiO_2) and titanium oxide (TiO_2) as the low- and high-index layers.

In the same field of endeavor, RICOH disclose a Faraday rotator arranged between alternating transparent dielectric layers in order to localize and enhance the magneto-optical effect. For this purpose RICOH teach that a variety of dielectric layer combinations can be used, but that silicon oxide (SiO_2) and titanium oxide (TiO_2) are generally sufficient (para. [0021]). One of ordinary skill would understand this to be a teaching of using the ubiquitous silica/titania combination known for its low cost attributable to its deposition parameters and relatively abundant raw materials.

It would have been obvious to one of ordinary skill to employ silicon oxide (SiO_2) and titanium oxide (TiO_2) as the dielectric layers in the Faraday rotator of Matsushita, et al, because these layers were an art-recognized equivalent for the purpose, as taught by RICOH. In the instant case, one of ordinary skill would have been motivated to

select the titanium oxide over tantalum oxide in the interest of using a lower-cost sputtering target.

Allowable Subject Matter

Claims 14, 15, 20, and 21 are allowable over the prior art. Claims 3, 8, 11, 12, 18, and 19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The reasons for the indication of allowable subject matter stand as set forth in the last Office action (paper #6).

Response to Amendment

Applicants' amendment of claim 5 is sufficient in overcoming the previous objection to claim 5 for an informality therein.

Applicants' amendment of claims 1 and 6 is sufficient in overcoming the previous rejection of claims 1, 3 – 6, 8, 10 – 13, 18, and 19 under 35 U.S.C. § 112, second paragraph.

Applicants' amendment of claim 16 is not sufficient to distinguish over Anthony, et al, and claims 16 and 17 stand rejected under 35 U.S.C. § 102(b) as being anticipated by this reference. As set forth in the rejection, Anthony, et al anticipate films containing hydrogen, as now recited. Although Applicants remark that they intend to claim only amorphous diamond-like carbon films, and although the examiner concurs the Anthony, et al disclose only *polycrystalline* diamond films. the recitation of hydrogen

in the film is clearly insufficient to distinguish over crystalline or polycrystalline films. Hydrogen is a common component of even single crystal diamond films, and the examiner believes that the presence of hydrogen is a necessary precursor to nucleation of the films.

Upon a survey of the prior art, the examiner agrees that one of ordinary skill would have recognized that the methods of the instant disclosure (*i.e.*, at para. [0101]) can lead only to diamond-like carbon films which are *amorphous*. It had long been thought that crystalline or polycrystalline "diamond films" are obtainable by high temperature deposition. The optimum temperature regime was formerly thought to be about 900°C for crystalline species (see H. Liu, cited below). More recently, crystalline "diamond films" have been deposited at temperatures as low as 130° C, but using a vastly different precursor gas mixture (see Miranaka, et al and Watanabe, et al cited below). Crystalline deposition was also achieved below 300° C, but only using *microwave* plasma (see A. Hiraka, cited below). Thus, it appears that one of ordinary skill would have recognized that the low temperature (200° C) method using methane in an rf plasma disclosed in the instant specification, *inherently* yields only *amorphous* diamond-like carbon films. Thus, it would *not* constitute new matter to include a remark in the specification (*e.g.*, near para. [0101]) that "It will be appreciated that the film thus obtained is an amorphous diamond-like carbon layer." Such a remark would provide appropriate antecedent basis for a recitation in claim 16 of the diamond-like carbon thin film is amorphous.

Applicants acknowledge that the expression "diamond-like carbon" has been used variously in the art to describe crystalline and polycrystalline forms in addition to amorphous forms. Although the claims are read in light of the specification, the expression has ordinary and accepted meaning in the art as broadly encompassing the polycrystalline species disclosed by Anthony, et al. Since "Applicant disclaims mono- or polycrystalline diamond films" (atop Pg. 14 of their remarks), there should be no reservation about incorporating the expression "amorphous" into claim 16 (with appropriate antecedent basis included in the specification, as suggested above). That failing, the scope of the claims encompasses the composition of Anthony, et al, and the rejection stands.

Applicants' amendment of claims 1 and 6 to recite a "selectively resonant structure" is not sufficient to distinguish over the prior art, and the rejection of claims 1, 5, 6, and 13 under §102(e) as being anticipated by Matsushita, et al (U.S. Patent Application Pub 2002/0063941 A1) stands as set forth above. The specification lacks an express definition of the expression "selectively resonant structure". However, it is understood that the "selective rotation" described *is* the result of selective resonance. However, paragraph [0064] describes the function of the half-wave cavity embodiment to "selectively rotate" a single wavelength. Thus, one of ordinary skill would infer that "selective" resonance means simply "resonance" so as to select one (or more) wavelength(s). Although the structure *disclosed* for selecting multiple wavelengths distinguishes over that of Matsushita, et al, the expression "selectively resonant" is so

broad in its ordinary meaning, and within the meaning of the specification as to include resonant structures such as those of Matsushita, et al.

Insofar as the base reference is believed not to be deficient in the manner urged by Applicants, the rejection of claims 4 and 10 are rejected under §103(a) as being unpatentable over Matsushita, et al (U.S. Patent Application Pub 2002/0063941 A1), in view of RICOH CO LTD (JP 11-030770 A; hereinafter "RICOH") stands as previously set forth.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Huimin Liu and David S. Dandy (DAIMOND CHEMICAL VAPOR DEPOSTION) discuss the various forms of diamond and diamond-like films.

A. Hiraki (*5th Int'l Symp. Atomically Controlled Surfaces . . .*) describes a low-temperature method of forming crystalline diamond films.

I. Watanabe and K. Yoishie (*Japan. J. Appl. Phys.*) describe a low-temperature method of forming crystalline diamond films in an rf-plasma.

Y. Muranaka, et al. (*Diamond Films and Techn.*) describe a low-temperature method of depositing crystalline diamond films.

Y. Muranaka, et al (*Novel Forms of Carbon Symp.*) describe a low-temperature method of depositing crystalline diamond films.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Juba whose telephone number is (703) 308-4812. The examiner can normally be reached on Mon.-Fri. 9 - 5.

On or about January 20, 2004, the examiner's new phone number is expected to be (571) 272-2314 at the Alexandria campus.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Drew Dunn can be reached on Mon.- Thu., 9 - 5.

The centralized fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306 for *all* communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.


JOHN JUBA
PRIMARY EXAMINER
Art Unit 2872

December 17, 2003